

# EICO

## **632 / CRT Tester and Rejuvenator**



## **OPERATING MANUAL**

## GENERAL DESCRIPTION

The Model 632 CRT Tester and Rejuvenator is a portable instrument providing excellent repair, and rejuvenation facilities for color and black-and-white picture tubes. Five sockets are provided on a single cable to accommodate new and old tube types. One of these sockets is solely for color tubes, and is wired to the tester to permit individual gun selection via a three-position switch on the panel. An accessory compartment in the luggage-type carrying case holds the multi-socket test cable and the line cord.

### FEATURES

1. Completely transformer-isolated from the power line on all functions for safety.
2. Measures actual beam current (derived from the actually effective part of the cathode) that is proportional to screen brightness, as controlled by the voltage on Grid 1.
3. Two ranges of Grid 2 voltage permit testing tubes using low voltage on G2.
4. Push-button selection of individual elements for short-open testing under hot cathode conditions. Employs neon lamp indicator. Quickly identifies location of inter-electrode short or leakage, or an open element. Table indicates, in each case, if repair procedure is possible and which to use.
5. Push-button selection of beam current, gas, and life tests. Provides greater convenience, versatility, and safety for both the tester and the tube under test.
6. Precisely controlled filament voltage, continuously variable in 3 ranges (0-5, 5-10, 10-15 VAC). Vital for determining applicability of a booster, rejuvenation and repair procedures, compensating for line voltage variation, and to prevent the possibility of obsolescence. Fine voltage control is a 25-watt rheostat, and exact filament voltage is read on the 0-5, 0-15 VAC meter scales.
7. Transformer-operated 150 volt negative DC supply (silicon rectifier) with a potentiometer providing continuously variable grid cut-off voltage read on the 0-150 VDC scale on the meter. Vital feature for determining the ability of the tube to provide proper contract, and for a sensitive gas test.
8. Transformer-operated 1000 VDC supply (6AX4 rectifier) for rejuvenation and repair of tube defects.
9. Accurate, easily read 4-1/2" D'Asenval meter with 3-color GOOD-?-BAD scales for beam current testing, 0-150 VDC scale for reading grid cut-off voltage, and 0-5, 0-15 VAC scales for reading filament voltage.
10. Up-to-date tube chart providing settings for color and black-and-white tubes.

### SPECIFICATIONS

1. Power Requirements: 117 VAC, 60 cycles
2. Size (HWD): 5-1/4" x 9-1/2" x 12"
3. Weight: 8 lbs.

## TESTING PROCEDURES

### TEST SET-UP

**CAUTION:** DO NOT connect the tester to a picture tube until instructed.

1. Set the CUT-OFF-CHECK control to AC OFF and plug the line cord into 120 VAC outlet.
2. Set the FUNCTION switch to SHORT-OPEN.
3. Look up the tube type to be tested in the picture tube chart. As per the chart, set the FIL. VOLTAGE switch to the appropriate range (Example: 5-10 for 6.3), and the G2 switch to HI or LO.
4. Set the FIL. ADJUSTMENT control to MIN. on the dial.
5. Rotate the CUT-OFF switch clockwise from AC OFF to turn the tester on.
6. If the tube is in the TV set, TURN THE SET OFF.
7. Remove the socket from the tube base in the set.
8. Refer to the chart for the SOCKET ADAPTOR number and locate the socket of this number on the test cable.
9. Plug the tube into the appropriate socket on the cable.
10. Adjust the FIL. ADJUSTMENT control for the exact filament voltage.

### FILAMENT CONTINUITY TEST

11. Press and hold down the LIFE button while observing the meter. If the filament is o.k., the meter reading will increase slightly. If the filament is open, no change in the meter reading will occur. After releasing the LIFE button, the meter reading will return to its previously set value. Note that an intermittent filament will cause erratic changes in the meter reading with the LIFE button up. In the case of an open or intermittent filament, try re-soldering filament pins in the base.

### SHORT AND OPEN ELEMENT TESTS

NOTE: Tests for shorted or open elements must precede any other tests, since either defect, if not cleared up, makes the picture tube unusable even if the emission were satisfactory.

12. Press down individually the K (cathode) button, the G1 (Grid 1) button and the G2 (Grid 2) button. Observe the neon lamp each time. The indications and their meanings are as follows:

- |                    |   |                 |
|--------------------|---|-----------------|
| a. One half lit    | — | no fault        |
| b. Both halves lit | — | shorted element |
| c. Entirely out    | — | open element    |

If the tests on K, G1, and G2 all show no fault, they proceed to the BEAM CURRENT test. Interpretations and procedures for other results are as follows:

RESULT	INTERPRETATION	PROCEDURE
G2 <u>only</u> shows short	FIL-G2 short	Reject Tube.
G1 and G2 shows short	G1-G2 short	Reject tube. CAUTION: Do NOT test BEAM CURRENT, as meter may be damaged.
G2 and K show short	G2-K short	Reject tube. CAUTION: Do NOT test BEAM CURRENT, as meter may be damaged.
G1 <u>only</u> shows short	FIL-G1 short	Reject tube.
G1 and K show short	G1-K short	Try short repair procedure.
K <u>only</u> shows short	FIL-K short	Do NOT attempt to repair, but proceed to other tests. If otherwise o.k., but hum appears in picture or there is no brightness control, it is possible to use the tube with a 1:1 filament isolating transformer wired into the set.
G1 shows open	G1 open or very low emission	Try resoldering G1 base pin, and then rejuvenation.
G2 shows open	G2 open or very low emission	Try resoldering G2 base pin, and then rejuvenation.
K shows open	K open or very low emission	Try resoldering K base pin, and then rejuvenation. If rejuvenation fails, try cathode tab welding procedure.

#### BEAM CURRENT TEST & LIFE TEST

13. If there is no fault indicated above, set the FUNCTION switch to BEAM-LIFE. Before proceeding, recheck to see that the G2 switch is set to the position given in the chart. CAUTION: Failure to set the G2 switch to the LO position on tubes that require it may result in the beam current rising to a value destructive to the tube. The HI position G2 voltage is 330V, and the LO position G2 voltage is 70V.

14. Press down the BEAM button, and the meter will indicate the condition of the tube on the meter GOOD-?-BAD scale. The meter is in the G2 circuit, and the reading is therefore proportional to the actual beam current (obtained from the actually useful area of the cathode) that is proportional to screen brightness. A tube reading in the red area, would be considered to have low emission. A tube reading in the yellow area is borderline in emission capability. Tubes reading in the green area are good and should not be subjected to rejuvenation.

15. With the FUNCTION switch remaining in the BEAM-LIFE position, first press and hold down the BEAM button. While holding down the BEAM button and observing the meter, depress the LIFE button. If the meter pointer drops rapidly to zero (within 5 seconds), the

tube has little active emitting surface on the cathode. In general, life expectancy of the tube would be poor. Rejuvenation may help a low emission problem.

#### ALTERNATE LIFE TESTING METHOD

16. Another method of estimating the remaining useful life of a tube is to observe how a moderate change in filament voltage affects the beam current reading. In a new tube, the change will be slight as the filament voltage is lowered or raised, because the cathode emission is plentiful. A tube that has been in extended service will show increased variation in beam current with filament voltage because of the lessened cathode emission. For this reason, a used tube that may test good, with the exactly correct filament voltage applied in the tester, may appear dim in a set where the filament voltage is somewhat low as a result of either low line voltage or normal voltage variation due to tolerances. (It is for this reason that filament voltage boosters, or "brighteners," are effective in extending the useful life of picture tubes). Consequently, the degree of change in beam current with a moderate decrease in filament voltage is a useful indicator of probable remaining tube life. The test method is to test for beam current as described in 13 and 14 above. Then, after allowing a few minutes for the emission to reach a constant value, re-set the FUNCTION switch to SHORT-OPEN and reduce the filament voltage by 20% with the FIL. ADJUSTMENT control. Next, return the FUNCTION switch to BEAM-LIFE and press down the BEAM button. A decline of the beam current into the yellow or red areas on the quality scale indicates a short life expectancy and the probable need for a booster within a short time. For your convenience, a table of rated filament voltages vs. 20% reduced filament voltages is given below.

Rated Filament Voltage	20% Reduced Value
2.34	1.9
2.68	2.1
6.3	5.0
8.4	6.7
12.6	10.0

#### CUT-OFF TEST & GAS TEST

17. Cut-off voltage is the amount of negative grid bias needed to cut off beam current in the tube. To check the cut-off voltage, set the FUNCTION switch to CUT-OFF/GAS. Turn the CUT-OFF CHECK control counter-clockwise just short of AC OFF. (Do not accidentally turn to AC OFF). Press and hold down the BEAM button and observe the beam current reading on the GOOD-?-BAD quality scale. The beam current reading will be at a maximum, very close to that measured in the BEAM CURRENT test. Continuing to press down the BEAM button, turn the CUT-OFF CHECK control clockwise until the meter pointer just hits the zero mark and no further. This is the cut-off point. Release the BEAM button, and the meter point will indicate the cut-off voltage on the 0-150 VDC scale. Normally, the cut-off voltage of the average tube is from -30 to -70 VDC, approximately. Excessively high cut-off voltage may sometimes be tolerated if the emission is exceptionally high.

18. For the gas test, the FUNCTION switch remains set at CUT-OFF/GAS, but the CUT-OFF CHECK control is used to set the negative grid bias to half the previously found cut-off voltage. For example, if the cut-off voltage was found to be -60 VDC in 17, set the negative grid bias to -30 VDC on the 0-150 VDC meter scale. Next, press and hold down the BEAM button and observe the meter indication. Then, without releasing the BEAM button, depress the GAS button while observing the meter indication. If there is an appreciable increase in the meter reading, the tube is gassy.



## REPAIR PROCEDURES

### CATHODE TAB WELDING

The purpose of this procedure is to attempt to repair a break in the weld between the cathode and its connecting tab. The symptom indicating the possible usefulness of this procedure would be an open cathode indication. Before this procedure is used, first resoldering of the cathode base pin and then rejuvenation should be attempted (in case the open cathode indication is really due to very low emission). To perform the cathode welding procedure, set the FUNCTION switch first to SHORT-OPEN, and increase the filament voltage to 25% above rated (6.3V to 8V, for example). Then set the FUNCTION switch to REJUV.-WELDING. With a small rubber hammer, tap lightly on the neck of the tube while depressing the BURNS-REJUVENATE button for 1 or 2 seconds. After that, re-set the FUNCTION switch to SHORT-OPEN and depress the K button to check for cathode continuity. If continuity is not restored, return the FUNCTION switch to SHORT-OPEN and increase the filament voltage to 40% above rated (6.3V to 8.8V, for example). Then set the FUNCTION switch to REJUV.-WELDING, and try the above described procedure again. If continuity is not restored, reject the tube.

### REJUVENATION (RESTORING EMISSION)

As explained previously, tubes that have seen extended service are considerably sensitive to filament voltage variation because of reduced emitting material on the cathode. Oftentimes, the use of a filament voltage booster or "brightener", can increase the emission sufficiently without the use of the rejuvenation process. The use of a booster is always preferable to rejuvenation because rejuvenation enlarges the small aperture in the G1 grid which passes the beam current, and thereby permanently affects the focus of the tube. To determine whether a booster will help, set the FUNCTION switch to BEAM-LIFE and adjust the filament voltage to 20% above rated (7.5V for a 6.3V tube). Press down the BEAM button. If the beam current is acceptable (even yellow area), then a booster is likely to work. If the beam current is in the red area, then a booster will not work and rejuvenation may be attempted. Do not attempt rejuvenation unless a booster will not work.

To rejuvenate, set the FUNCTION switch first to SHORT-OPEN and set the filament voltage to the rated value. Then set the FUNCTION switch to REJUV.-WELDING, and depress the BURNS-REJUVENATE button for not more than one second. After that, re-set the FUNCTION switch to BEAM-LIFE and depress the BEAM button to check the beam current. If the beam current meter indication is acceptable (even yellow area), do NOT attempt further rejuvenation. If the beam current is still unacceptable (red area), repeat the rejuvenation procedure with 15% higher filament voltage (6.3V to 7.2V, for example), and then re-check the BEAM current. If the beam current is still unsatisfactory, repeat the rejuvenation procedure again with 20% or even 25% higher filament voltage (6.3V to 7.5V or 8.0V, for example), and then re-check the beam current. If the beam current is still unacceptable, reject the tube. NOTE: In some extreme cases, the rejuvenation time may be extended to two seconds, but not more!

### SHORT REPAIR

This procedure is suitable for clearing a G1-K short of the particle variety, where the arc formed may burn the particle off. Set the FUNCTION switch to BURNS. Depress the BURNS-REJUVENATE button for one second. Re-set the FUNCTION switch to SHORT-OPEN and check for clearing of the G1-K short. If the short persists, return the FUNCTION switch to BURNS and depress BURNS-REJUVENATE button for several seconds. Again check for clearing of the G1-K short. If the short is not cleared, reject the tube.

## TESTING COLOR TUBES

Color tubes are tested exactly as are black-and-white tubes, except that the GUN SELECTOR switch is used to select the red, green, and blue guns in turn for testing. (The GUN SELECTOR switch has no effect in testing black-and-white tubes, since it switches only the leads from the color socket).

In testing color tubes, bear in mind that the three guns should not be too dissimilar in characteristics or it may not be possible to compensate for the differences in the set.

Any attempt at rejuvenation in a color tube should be done very carefully, and only after the possibility of using a booster has been explored without success. Use the same procedure as for rejuvenating a black-and-white tube, and make sure that you are rejuvenating the defective gun only.

## MAINTENANCE

### METER ZERO

For proper operation of the tester, the meter pointer must indicate zero when the instrument is turned off. If it does not, adjust the mechanical zero-adjust screw on the meter face, using a small screwdriver, until the pointer indicates zero.

### CLEANING TUBE SOCKET TERMINALS

After a long period of time, a film of dirt may form on the inside contact surfaces of the tube socket terminals which will prevent good contact from being made with the pins of an inserted tube. If this condition occurs, spray or pour a small amount of contact cleaner into the socket terminals. This will remove the dirt film and restore good contact surfaces.

### NEW TUBES

EICO periodically issues a new tube chart, which will be available at a nominal charge. By filling out and returning the registration card included with each instrument, the owner can be assured of notification when a new tube chart is available.

## SERVICE CONSULTATION

If you are experiencing trouble that you cannot diagnose yourself, you are invited to avail yourself of the EICO Customer Service Department. The consultant handling your inquiry will make every effort to diagnose the cause of your particular difficulty based on the information that you provide. Please be as thorough as possible. Include the following information about your unit.

- a) Have you made a thorough check of the wiring, checking also for cold solder joints, or accidental shorting between parts, or to panel? (Check to see whether a bare wire or lead extends far enough to be shorted when the instrument is installed in its cabinet.
- b) Does the trouble occur at one time or one operating situation, but not at another time or operating situation? Be as specific as possible in this respect.
- c) Have you observed any peculiarity about a part? If a part appears charred or otherwise damaged by excessive heat, please say so. If you think you have damaged a particular part in the assembly or wiring, please say so. In conjunction with the symptoms, the consultant may be able to determine whether such a part is likely to be defective.

## PARTS REPLACEMENT

If it appears that a component is defective, and you desire a replacement from EICO, address your correspondence to your Customer Service Department.

If you are claiming the right to a no-charge replacement under the terms and conditions of the warranty, it is required that you shall have sent in the registration card within 10 days of the date of purchase, and that you send back the defective part transportation prepaid. EICO will make the necessary replacement at no charge for parts eligible under the terms and conditions of the warranty. Please read the warranty on the subject of parts eligible for replacement.

Further information required on a part returned to the factory for a no-charge replacement under the terms and conditions of the warranty is as follows:

- a) Model number and serial number of unit.
- b) Stock number and description of part as given on parts list.
- c) Describe as completely as possible the nature of the defect, or your reason for requiring replacement.

## FACTORY REPAIR SERVICE

EICO maintains a Factory Repair Service Department for in-warranty or out-of-warranty repair of EICO equipment. It is intended to serve those customers who are not adequately familiar with electronics to make use of the EICO Service Consultation facilities, or whose difficulties cannot be solved by correspondence.

For all out-of-warranty units, there is a minimum labor and handling fee. For the Model 632, this fee is \$7.00. Charges for components replaced are additional to the minimum fee.

For in-warranty completed kit units, there is a minimum labor and handling fee. For the Model 632, this fee is \$7.00. There is no charge for a replaced defective part provided that the terms and conditions of the warranty for no charge replacement are not violated in the judgement of EICO.

For in-warranty factory-wired units, there is no labor and handling fee if the unit complies with the terms and conditions of the warranty in the judgement of EICO. However, if the terms and conditions of the warranty are violated, then there will be charged to the customer a minimum labor and handling fee plus the cost of parts replaced.

In all cases, the unit must be sent to the factory transportation prepaid, and the unit will be returned to the customer transportation collect.

The services rendered for the minimum labor and handling fee are the correction of any minor wiring errors (not extensive corrections or re-wiring), the labor involved in replacing defective parts, and any adjustments, alignment, or calibration procedures that would normally be performed on a factory-wired unit. Units not wired according to instructions, or modified in any way, or showing evidence of the use of acid core solder, will not be serviced and will be returned to the customer forthwith.

Units requiring extensive corrections or re-wiring will incur an additional labor charge which will be set by EICO. The customer will be informed of this situation and written authorization from the customer will be required before the work is done.

Please Note: Minimum labor and handling fees are subject to revision at any time.



## LOCAL REPAIR FACILITIES

Out-of-warranty repair work may also be performed by authorized service stations as well as the EICO factory. A list of authorized service stations is provided with this manual. The roster of stations may change from time to time, and if considerable time has elapsed since you purchased your unit, you are advised to contact the station you choose before sending the unit to them for repair. Use of a local service station will often result in faster service, and usually, lower transportation costs.

It is necessary that you comply with the Shipping Instructions that follow when sending in a unit for service.

## SHIPPING INSTRUCTIONS

You are strongly advised to retain the original shipping carton and inserts in the case that re-shipment is required for service or any other purpose. The carton may be collapsed, for storage in as small a space as possible. In very many cases, the same carton is used for kit and factory-wired units so that the kit carton will serve for re-shipment of the completed kit.

To submit a unit for service, either to the factory or an authorized service station\*, fill out completely the Service Work Order form provided with the manual. Pack the unit very carefully, preferably in the original shipping carton with the original inserts.

If this is not possible, use a strong oversize carton, preferably wood, allowing at least 3 inches of resilient packing material such as shredded paper or excelsior, to be inserted between all sides of the unit and the carton. Seal the carton with strong gummed paper tape or strong twine, or both. Include the Service Work Order in the carton and in addition, attach a tag to the instrument on which is printed your name and address and brief reference to the trouble experienced. Affix "FRAGILE" or "HANDLE WITH CARE" labels to at least four sides of the carton, or print these words large and clear with a bright color crayon. Ship by prepaid Railway Express or parcel post to:

EICO Electronic Instrument Co., Inc.  
131-01 39th Avenue  
Flushing, N.Y. 11352  
Attention: Repair Department

Include your name and address on the outside of the carton. Return shipment will be made transportation charges collect. Note that a carrier cannot be held liable for damages in transit, if packing, IN HIS OPINION, is insufficient.

\*Authorized service stations are for out-of-warranty units only, unless the station is specifically noted on the List of Authorized Service Stations to be authorized for other work.

## THE EICO WARRANTY

The EICO ELECTRONIC INSTRUMENT CO., INC., hereafter referred to as EICO, warrants that, for a period of 90 days from the date of purchase, any EICO kit will be free of defects in parts, and that any EICO factory-wired unit will be free of defects in parts and workmanship. For an EICO kit, EICO's obligation is limited to those parts which are returned transportation pre-paid to the factory without further damage, and in the judgement of EICO are either originally defective or have become defective in normal use. For an EICO factory-wired unit, EICO's obligation is limited to those parts, sections, or the entire unit which is returned transportation pre-paid to the factory without further damage, and in the judgement of EICO are either originally defective or have become defective in normal use.

The warranty does not apply to any parts damaged in the course of handling, assembling, or wiring by the customer, or damaged due to abnormal usage or in violation of instructions or reasonable practice, or further damaged to a consequential degree in return shipment. Furthermore, the foregoing warranty is made only to the original customer, and is and shall be in lieu of all other warranties whether expressed or implied, and of all other obligations or liabilities on the part of EICO, and in no event shall EICO be liable for any anticipated profits, consequential damages, loss of time, or other losses incurred by the customer in connection with the purchase or operation of EICO products or components thereof.

The registration card, which accompanies each EICO kit or factory-wired unit, must be filled in and returned to the company within 10 days after the date of purchase. This warranty applies only to registered units.

## PARTS LIST

SYM#	STOCK#	DESCRIPTION
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### CAPACITORS

C1	20055	tubular, .1ufd, 1600V
C2	23071	elect., 10ufd, 250V
C3	20012	tubular, .002ufd, 400V

### DIODES

CR1	93005	200ma, 380 PIV
CR2	95000	IN48

### POTENTIOMETERS

P1	19023	5Ω, 25 watt
P2/S7	18121	50KΩ, W/SPST

### RESISTORS

(All resistors are 1/2 watt, 10% unless otherwise noted).

R1	10964	1KΩ, 2W, 10% (brown, black, red, silver)
R2	10402	10MΩ (brown, black, blue, silver)
R3	10853	10KΩ, 1W, 10% (brown, black, orange, silver)
R4	13006	4240Ω, 1/2W, 1%
R5	13007	1920Ω, 1/2W, 1%
R6	10435	150KΩ (brown, green, yellow, silver)
R7, 8, 9	10428	47KΩ (yellow, violet, orange, silver)
R10	10407	1MΩ (brown, black, green, silver)
R11	10410	100KΩ (brown, black, yellow, silver)

# SWITCHES

S1	60134	function, rotary
S2	60135	filament, rotary
S3	65008	pushbutton
S4	62005	slide, DP3T
S5	64006	pushbutton, Burns-Rej.
S6	62002	slide, SPDT
S7	18121	ON P2

# HARDWARE

40000	nut, #6-32	(12)
40001	nut, 3/8"	(6)
40016	nut, 1/2"	(1)
40034	nut, Tinnerman #4-40	(6)
41016	screw, #4-40 x 1/4	(8)
41043	screw, #4, wood	(10)
41086	screw, #6-32 x 5/16	(10)
42000	washer, lock, 3/8"	(6)
42001	washer, flat, 3/8"	(6)
42002	washer, lock, #6	(10)
42029	washer, rubber 1/2"	(1)
43001	lug, pot ground 3/8"	(1)
43004	lug, #8 solder	(2)

SYM. #	STOCK#	DESCRIPTION
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# MISCELLANEOUS

F1	91006	fuse, 1 Amp, Slo Blo
M1	72013	meter
N1	92004	bulb, neon NE-45
T1	30070	transformer, power
TB1	54018	terminal strip, 4 post w/gnd.
TB2	54004	terminal strip, 2 post w/gnd.
V1	90092	tube, 6AX4
XF1	97800	fuseholder
XN1	97006	pilot light assembly
XV1	97032	socket, octal
	53011	knob, pointer (4)
	53012	knob, pushbutton (6)
	57000	line cord, black (1)
	80157	panel, front (1)
	81393	bracket, tube (1)
	82101	strain relief for line cord (1)
	82107	strain relief for cable assembly (1)
	86533	cable assembly
	88119	carrying case (1)
	97724	lens for pilot light (1)
	66149	Instruction Manual
	66390	Construction Book

# TUBE CHART — MODEL 632 T

Tube Type	Fil. Volt	Socket Adap.	G-2	Tube Type	Fil. Volt	Socket Adap.	G-2	Tube Type	Fil. Volt	Socket Adap.	G-2	Tube Type	Fil. Volt	Socket Adap.	G-2	Tube Type
2EP4	6.	2	HI	12KP4	6.3	4	HI	14DP4	6.3	4	HI	16AEP4	6.3	4	HI	16WP4
7DP4	6.3	4	HI	12LP4	6.3	4	HI	14EP4	6.3	4	HI	16AFP4	6.3	4	HI	16XP4
7HP4	6.3	4	HI	12QP4	6.3	4	HI	14GP4	6.3	4	HI	16AKP7	6.3	4	HI	16YP4
7QP4	6.3	4	HI	12RP4	6.3	4	HI	14HP4	6.3	4	HI	16ATP4	6.3	1	LO	16ZP4
7RP4	6.3	4	HI	12TP4	6.3	4	HI	14KP4	6.3	4	HI	16CP4	6.3	4	HI	17AP4
7TP4	6.3	4	HI	12UP4	6.3	4	HI	14NP4	6.3	4	HI	16DP4	6.3	4	HI	17ASP4
8DP4	6.3	4	HI	12XP4	6.3	4	HI	14QP4	6.3	4	HI	16EP4	6.3	4	HI	17ATP4
8FP4	6.3	4	HI	12YP4	6.3	4	HI	14RP4	6.3	4	HI	16FP4	6.3	4	HI	17AVP4
8KP4	6.3	4	HI	12ZP4	6.3	4	HI	14SP4	6.3	4	HI	16GP4	6.3	4	HI	17BP4
8LP4	6.3	3	HI	14ACP4	6.3	4	LO	14UP4	6.3	4	HI	16HP4	6.3	4	HI	17BJP4
8MP4	6.3	4	HI	14AEP4	6.3	4	LO	14WP4	6.3	4	HI	16JP4	6.3	4	HI	17BKP4
8XP4	6.3	4	HI	14AJP4	6.3	1	HI	14XP4	6.3	4	HI	16KP4	6.3	4	HI	17BMP4
10ABP4	6.3	4	HI	14ARP4	6.3	4	HI	14ZP4	6.3	4	HI	16LP4	6.3	4	HI	17BN4
10ADP4	8.4	4	HI	14ASP4	6.3	1	HI	15AP4	6.3	4	HI	16MP4	6.3	4	HI	17BRP4
10AEP4	6.3	4	HI	14ATP4	8.4	4	HI	15CP4	6.3	4	HI	16QP4	6.3	4	HI	17BSP4
10BP4	6.3	4	HI	14AUP4	6.3	4	LO	15DP4	6.3	4	HI	16RP4	6.3	4	HI	17BTP4
10DP4	6.3	4	HI	14AVP4	6.3	1	HI	15EP4	6.3	4	HI	16SP4	6.3	4	HI	17BUP4
10FP4	6.3	4	HI	14AWP4	6.3	4	LO	16AP4	6.3	4	HI	16TP4	6.3	4	HI	17BVP4
10RP4	6.3	4	HI	14BP4	6.3	4	HI	16ABP4	6.3	4	HI	16UP4	6.3	4	HI	17BWP4
12JP4	6.3	4	HI	14CP4	6.3	4	HI	16ACP4	6.3	4	HI	16VP4	6.3	4	HI	17BYP4

Tube Type	Fil. Volt	Socket Adap.	G-2	Tube Type	Fil. Volt	Socket Adap.	G-2	Tube Type	Fil. Volt	Socket Adap.	G-2	Tube Type	Fil. Volt	Socket Adap.	G-2	Tube Type
19BP4	6.3	1	LO	19FP4	6.3	4	HI	21AMP4	6.3	4	HI	21CHP4	6.3	4	LO	21DMP4
19BRP4	6.3	1	HI	19GP4	6.3	4	HI	21ANP4	6.3	4	HI	21CKP4	6.3	4	HI	21DNP4
19BSP4	6.3	1	HI	19JP4	6.3	4	HI	21AQP4	6.3	4	HI					21DQP4
19BTP4	6.3	1	HI	19QP4	6.3	4	HI	21ARP4	6.3	4	HI	21CLP4	6.3	4	HI	21DRP4
19BVP4	6.3	1	HI	19XP4	6.3	1	HI	21ASP4	6.3	4	HI	21CMP4	6.3	4	HI	21DSP4
19BWP4	6.3	1	HI	19YP4	6.3	1	HI	21ATP4	6.3	4	HI	21CQP4	6.3	3	HI	21DVP4
19CDP4	6.3	3	LO	19ZP4	6.3	1	HI	21AUP4	6.3	4	HI	21CSP4	6.3	3	HI	21DWP4
19BTP4	6.3	1	HI	20BP4	6.3	4	HI	21AVP4	6.3	4	HI	21CUP4	6.3	4	HI	21EP4
19BVP4	6.3	1	HI	20CP4	6.3	4	HI	21AWP4	6.3	4	HI	21CVP4	6.3	4	HI	21EAP4
19BWP4	6.3	1	HI	20DP4	6.3	4	HI	21AYP4	6.3	4	HI	21CWP4	6.3	4	HI	21ELP4
19CAP4	6.3	1	HI	20FP4	6.3	4	HI	21BAP4	6.3	4	HI	21CXP4	6.3	4	LO	21EMP4
19CDP4	6.3	3	LO	20GP4	6.3	4	HI	21BCP4	6.3	4	HI	21CQP4	6.3	1	HI	21ENP4
19CEP4	6.3	1	HI	20HP4	6.3	4	HI	21BDP4	6.3	4	HI	21DP4	6.3	4	HI	21EQP4
19CFP4	6.3	1	LO	20JP4	6.3	4	HI	21BNP4	6.3	4	HI	21DAP4	6.3	1	HI	21ERP4
19CGP4	6.3	4	HI	20LP4	6.3	4	HI	21BSP4	6.3	4	HI	21DEP4	6.3	1	HI	21ESP4
19CHP4	6.3	1	LO	20MP4	6.3	4	HI	21BTP4	6.3	4	HI	21DFP4	6.3	1	HI	21EVP4
19CKP4	6.3	1	LO	21AP4	6.3	4	HI	21CBP4	6.3	4	HI	21DHP4	6.3	1	HI	21EWP4
19CLP4	6.3	4	LO	21ACP4	6.3	4	HI	21CDP4	6.3	4	HI	21DJP4	6.3	4	HI	21EXP4
19DP4	6.3	4	HI	21AFP4	6.3	4	HI	21CEP4	6.3	1	HI	21DKP4	6.3	1	HI	21EYP4
19EP4	6.3	4	HI	21ALP4	6.3	4	HI	21CGP4	6.3	4	LO	21DLP4	6.3	4	HI	21FP4

Tube Type	Fil. Volt	Socket Adap.	G-2	Tube Type	Fil. Volt	Socket Adap.	G-2	Tube Type	Fil. Volt	Socket Adap.	G-2
23NP4	6.3	1	LO	24ANP4	6.3	4	HI	24ZP4	6.3	4	HI
23RP4	6.3	1	HI	24AQP4	6.3	1	HI	24AP4	6.3	4	HI
23SP4	6.3	1	HI	24ASP4	6.3	4	HI	27ABP4	6.3	1	HI
23TP4	6.3	4	HI	24ATP4	6.3	4	LO	27AEP4	6.3	1	HI
23UP4	6.3	1	HI	24AUP4	6.3	4	HI	27EP4	6.3	4	HI
23VP4	6.3	1	HI	24AVP4	2.34	2	HI	27GP4	6.3	4	HI
23WP4	6.3	1	HI	24AWP4	6.3	1	HI	27LP4	6.3	4	HI
23XP4	6.3	4	HI	24AXP4	6.3	1	HI	27MP4	6.3	4	HI
23YP4	6.3	4	HI	24BP4	6.3	4	HI	27NP4	6.3	4	HI
23ZP4	6.3	4	LO	24BAP4	6.3	1	LO	27RP4	6.3	4	HI
24AP4	6.3	4	HI	24CP4	6.3	4	HI	27SP4	6.3	4	HI
24ADP4	6.3	4	HI	24DP4	6.3	4	HI	27UP4	6.3	4	HI
24AEP4	6.3	4	HI	24QP4	6.3	4	HI	27VP4	6.3	4	HI
24AHP4	6.3	1	HI	24TP4	6.3	4	HI	27XP4	6.3	4	HI
24AJP4	6.3	4	LO	24VP4	6.3	4	HI	27ZP4	6.3	1	HI
24ALP4	6.3	1	HI	24XP4	6.3	4	HI	30BP4	6.3	4	HI
24AM4	6.3	3	HI	24YP4	6.3	4	HI				



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Tube Type	Fil. Volt	Socket Adap.	G-2
16WP4	6.3	4	HI
16XP4	6.3	4	HI
16YP4	6.3	4	HI
16ZP4	6.3	4	HI
17AP4	6.3	4	HI
17ASP4	6.3	4	HI
17ATP4	6.3	4	HI
17AVP4	6.3	4	HI
17BP4	6.3	4	HI
17BJP4	6.3	4	HI
17BKP4	6.3	4	HI
17BMP4	6.3	4	LO
17BN4	6.3	4	LO
17BRP4	6.3	1	HI
17BSP4	6.3	4	HI
17BTP4	6.3	4	HI
17BUP4	6.3	4	HI
17BVP4	6.3	3	HI
17BWP4	6.3	3	HI
17BYP4	6.3	3	HI
17BZP4	6.3	4	HI
17CP4	6.3	4	HI
17CAP4	6.3	1	HI
17CBP4	6.3	4	HI
17CDP4	8.4	1	HI
17CEP4	6.3	4	HI
17CFP4	6.3	4	HI
17CGP4	6.3	4	HI
17CKP4	6.3	1	HI
17CLP4	6.3	4	HI
17CMP4	6.3	4	LO
17CNP4	6.3	4	LO
17CRP4	6.3	4	LO
17CSP4	6.3	3	HI
17CTP4	6.3	1	HI
17CUP4	6.3	4	HI
17CVP4	6.3	1	HI
17CWP4	6.3	1	HI
17CXp4	6.3	4	LO
17CYP4	6.3	4	HI

Tube Type	Fil. Volt	Socket Adap.	G-2
17CZP4	6.3	4	HI
17DAP4	2.68	2	HI
17DBP4	6.3	4	HI
17DCP4	6.3	4	HI
17DEP4	2.34	2	HI
17DHP4	6.3	1	HI
17DJP4	6.3	4	HI
17DKP4	6.3	1	HI
17DLP4	6.3	1	HI
17DQP4	6.3	3	LO
17DRP4	2.68	2	HI
17DSP4	6.3	1	HI
17DTP4	6.3	1	HI
17DWP4	6.3	4	HI
17DXP4	6.3	1	HI
17DZP4	6.3	1	HI
17EBP4	6.3	1	HI
17FP4	6.3	4	HI
17GP4	6.3	4	HI
17HP4	6.3	4	HI

Tube Type	Fil. Volt	Socket Adap.	G-2
17JP4	6.3	4	HI
17KP4	6.3	4	HI
17LP4	6.3	4	HI
17QP4	6.3	4	HI
17RP4	6.3	4	HI
17SP4	6.3	4	HI
17TP4	6.3	4	HI
17UP4	6.3	4	HI
17VP4	6.3	4	HI
17YP4	6.3	4	HI
19AP4	6.3	4	HI
19ABP4	2.68	2	HI
19ACP4	6.3	1	LO
19AEP4	12.6	1	LO
19AFP4	6.3	1	HI
19AHP4	6.3	1	HI
19AJP4	6.3	3	LO
19ALP4	6.3	1	HI
19ANP4	6.3	1	HI
19AOP4	6.3	1	HI

Tube Type	Fil. Volt	Socket Adap.	G
19ARP4	6.3	1	1
19ASP4	6.3	1	1
19ATP4	6.3	1	1
19AUP4	6.3	1	1
19AVP4	6.3	1	1
19AXP4	6.3	1	1
19AYP4	6.3	1	1
19AZP4	6.3	1	1
19BAP4	6.3	1	1
19BCP4	6.3	1	1
19BDP4	6.3	4	1
19BFP4	6.3	4	1
19BGP4	6.3	4	1
19BHP4	6.3	1	1
19BJP4	6.3	1	1
19BLP4	6.3	1	1
19BMP4	6.3	1	1
19BNP4	6.3	1	1

Tube Type	Fil. Volt	Socket Adap.	G-2	Tube Type	Fil. Volt	Socket Adap.	G-2
210MP4	6.3	1	HI	21FAP4	6.3	1	HI
210NP4	6.3	4	HI	21FCP4	6.3	1	HI
210QP4	6.3	4	HI	21FDP4	6.3	2	HI
10RP4	6.3	4	HI	21FLP4	6.3	4	HI
10SP4	6.3	4	LO	21FMP4	6.3	1	LO
10VP4	6.3	4	HI	21JP4	6.3	4	HI
10WP4	6.3	1	HI	21KP4	6.3	4	HI
1EP4	6.3	4	HI	21MP4	6.3	4	HI
1EAP4	2.3/4	2	HI	21WP4	6.3	4	HI
1ELP4	6.3	4	HI	21XP4	6.3	4	HI
1EMP4	6.3	1	HI	21YP4	6.3	4	HI
1ENP4	6.3	4	HI	21ZP4	6.3	4	HI
1EQP4	6.3	1	HI	22AP4	6.3	4	HI
1ERP4	6.3	1	HI	22CP7	6.3	4	HI
1ESP4	6.3	1	HI	22CP14	6.3	4	HI
1EVP4	2.3/8	2	HI	22CP19	6.3	4	HI
1EWP4	6.3	4	HI	22CP25	6.3	4	HI
1EXP4	6.3	1	HI	22DP7	6.3	4	HI
1EYP4	6.3	4	HI	22DP14	6.3	4	HI
1FP4	6.3	4	HI	22DP19	6.3	4	HI

Tube Type	Fil. Volt	Socket Adap.	G-2
22DP25	6.3	4	HI
23ACP4	6.3	4	HI
23AFP4	6.3	4	HI
23AFP4	6.3	4	HI
23AHP4	6.3	4	HI
23AKP4	6.3	1	HI
23ALP4	6.3	1	HI
23AMP4	6.3	1	HI
23ANP4	6.3	4	LO
23AQP4	6.3	1	HI
23ARP4	6.3	1	HI
23ASP4	6.3	4	HI
23ATP4	6.3	4	LO
23AUP4	6.3	4	LO
23AVP4	6.3	1	HI
23AWP4	6.3	4	LO
23AYP4	6.3	1	HI
23AZP4	6.3	4	HI
23BP4	6.3	1	HI
23RAP4	6.3	1	HI

Tube Type	Fil. Volt	Socket Adap.	G-2
23BCP4	6.3	1	HI
23BDP4	6.3	4	HI
23BEP4	6.3	1	HI
23BGP4	6.3	1	LO
23BHP4	6.3	1	LO
23BJP4	6.3	4	LO
23BKP4	6.3	4	LO
23BLP4	6.3	4	LO
23BMP4	6.3	4	HI
23BNP4	6.3	1	HI
23BOP4	6.3	1	HI
23BRP4	6.3	1	HI
23BSP4	6.3	1	HI
23BTP4	6.3	4	HI
23BUP4	6.3	1	LO
23BYP4	6.3	1	HI
23BVP4	6.3	4	HI
23BZP4	8.4	4	HI
23CP4	6.3	1	HI
23CAP4	8.4	4	HI

Tube Type	Fil. Volt	Socket Adap.
23CBP4	6.3	1
23CDP4	6.3	4
23CEP4	6.3	1
23CMP4	6.3	1
23CQP4	6.3	1
23CSP4	6.3	1
23CTP4	6.3	4
23CUP4	6.3	1
23CVP4	6.3	1
23CWP4	6.3	1
23CXP4	6.3	1
23CZP4	6.3	4
23DP4	6.3	1
23DBP4	6.3	1
23FP4	6.3	1
23GP4	6.3	1
23HP4	6.3	1
23JP4	6.3	3
23KP4	6.3	1
23MP4	6.3	1

## COLOR TUBES

21AXP22 *	6.3	5	HI
21AXP22A*	6.3	5	HI
21CYP22 *	6.3	5	HI
21CYP22A*	6.3	5	HI

21FBP22	± 6.3	5	HI
21FJP22	± 6.3	5	HI
21FKP22	± 6.3	5	HI

\*TUBE GOOD IF READS 45 OR MORE ON THE 0-150 SCALE

‡ TUBE GOOD IF READS 30 OR MORE ON THE 0-150 SCALE

G-2

[illegible]

# TESTER AND REJUVENATOR

Fil. Volt	Socket Adap.	G-2	Tube Type	Fil. Volt	Socket Adap.	G-2
6.3	4	HI	17BZP4	6.3	1	HI
6.3	4	HI	17CP4	6.3	4	HI
6.3	4	HI	17CAP4	6.3	1	HI
6.3	4	HI	17CBP4	6.3	4	HI
6.3	4	HI	17CDP4	8.4	1	HI
6.3	4	HI	17CEP4	6.3	4	HI
6.3	4	HI	17CFP4	6.3	4	HI
6.3	4	HI	17CGP4	6.3	4	HI
6.3	4	HI	17CKP4	6.3	1	HI
6.3	4	HI	17CLP4	6.3	4	HI
6.3	4	HI	17CMP4	6.3	4	LO
6.3	4	LO	17CNP4	6.3	4	LO
6.3	4	LO	17CRP4	6.3	4	LO
6.3	1	HI	17CSP4	6.3	3	HI
6.3	4	HI	17CTP4	6.3	1	HI
6.3	4	HI	17CUP4	6.3	4	HI
6.3	4	HI	17CVP4	6.3	1	HI
6.3	3	HI	17CWP4	6.3	1	HI
6.3	3	HI	17CXP4	6.3	4	LO
6.3	3	HI	17CYP4	6.3	4	HI

Tube Type	Fil. Volt	Socket Adap.	G-2
17CZP4	6.3	4	HI
17DAP4	2.68	2	HI
17DBP4	6.3	4	HI
17DCP4	6.3	4	HI
17DEP4	2.34	2	HI
17DHP4	6.3	1	HI
17DJP4	6.3	4	HI
17DKP4	6.3	1	HI
17DLP4	6.3	1	HI
17DQP4	6.3	3	LO
17DRP4	2.68	2	HI
17DSP4	6.3	1	HI
17DTP4	6.3	1	HI
17DWP4	6.3	4	HI
17DXP4	6.3	1	HI
17DZP4	6.3	1	HI
17EBP4	6.3	1	HI
17FP4	6.3	4	HI
17GP4	6.3	4	HI
17HP4	6.3	4	HI

Tube Type	Fil. Volt	Socket Adap.	G-2
17JP4	6.3	4	HI
17KP4	6.3	4	HI
17LP4	6.3	4	HI
17QP4	6.3	4	HI
17RP4	6.3	4	HI
17SP4	6.3	4	HI
17TP4	6.3	4	HI
17UP4	6.3	4	HI
17VP4	6.3	4	HI
17YP4	6.3	4	HI
19AP4	6.3	4	HI
19ABP4	2.68	2	HI
19ACP4	6.3	1	LO
19AEP4	12.6	1	LO
19AFP4	6.3	1	HI
19AHP4	6.3	1	HI
19AJP4	6.3	3	LO
19ALP4	6.3	1	HI
19ANP4	6.3	1	HI
19AQP4	6.3	1	HI

Tube Type	Fil. Volt	Socket Adap.	G-2
19ARP4	6.3	1	HI
19ASP4	6.3	1	HI
19ATP4	6.3	1	HI
19AUP4	6.3	1	HI
19AVP4	6.3	1	HI
19AXP4	6.3	1	HI
19AYP4	6.3	1	HI
19AZP4	6.3	1	HI
19BAP4	6.3	1	HI
19BCP4	6.3	1	HI
19BDP4	6.3	4	LO
19BFP4	6.3	4	HI
19BGP4	6.3	4	HI
19BHP4	6.3	1	HI
19BJP4	6.3	1	HI
19BLP4	6.3	1	HI
19BMP4	6.3	1	HI
19BNP4	6.3	1	LO

il. Alt	Socket Adap.	G-2	Tube Type	Fil. Volt	Socket Adap.	G-2
3	1	HI	21FAP4	6.3	1	HI
3	4	HI	21FCP4	6.3	1	HI
3	4	HI	21FDP4	6.3	2	HI
3	4	HI	21FLP4	6.3	4	HI
3	4	LO	21FMP4	6.3	1	LO
3	4	HI	21JP4	6.3	4	HI
3	1	HI	21KP4	6.3	4	HI
3	4	HI	21MP4	6.3	4	HI
34	2	HI	21WP4	6.3	4	HI
3	4	HI	21XP4	6.3	4	HI
3	1	HI	21YP4	6.3	4	HI
3	4	HI	21ZP4	6.3	4	HI
3	1	HI	22AP4	6.3	4	HI
3	1	HI	22CP7	6.3	4	HI
3	1	HI	22CP14	6.3	4	HI
8	2	HI	22CP19	6.3	4	HI
3	4	HI	22CP25	6.3	4	HI
3	1	HI	22DP7	6.3	4	HI
3	4	HI	22DP14	6.3	4	HI
3	4	HI	22DP19	6.3	4	HI

Tube Type	Fil. Volt	Socket Adap.	G-2
22DP25	6.3	4	HI
23ACP4	6.3	4	HI
23AFP4	6.3	4	HI
23AFP4	6.3	4	HI
23AHP4	6.3	4	HI
23AKP4	6.3	1	HI
23ALP4	6.3	1	HI
23AMP4	6.3	1	HI
23ANP4	6.3	4	LO
23AQP4	6.3	1	HI
23ARP4	6.3	1	HI
23ASP4	6.3	4	HI
23ATP4	6.3	4	LO
23AUP4	6.3	4	LO
23AVP4	6.3	1	HI
23AWP4	6.3	4	LO
23AYP4	6.3	1	HI
23AZP4	6.3	4	HI
23BP4	6.3	1	HI
23BAP4	6.3	1	HI

Tube Type	Fil. Volt	Socket Adap.	G-2
23BCP4	6.3	1	HI
23BDP4	6.3	4	HI
23BEP4	6.3	1	HI
23BGP4	6.3	1	LO
23BHP4	6.3	1	LO
23BJP4	6.3	4	LO
23BKP4	6.3	4	LO
23BLP4	6.3	4	LO
23BMP4	6.3	4	HI
23BNP4	6.3	1	HI
23BQP4	6.3	1	HI
23BRP4	6.3	1	HI
23BSP4	6.3	1	HI
23BTP4	6.3	4	HI
23BUP4	6.3	1	LO
23BYP4	6.3	1	HI
23BVP4	6.3	4	HI
23BZP4	8.4	4	HI
23CP4	6.3	1	HI
23CAP4	8.4	4	HI

Tube Type	Fil. Volt	Socket Adap.	G-2
23CBP4	6.3	1	HI
23CDP4	6.3	4	HI
23CEP4	6.3	1	HI
23CMP4	6.3	1	HI
23CQP4	6.3	1	HI
23CSP4	6.3	1	HI
23CTP4	6.3	4	HI
23CUP4	6.3	1	HI
23CVP4	6.3	1	HI
23CWP4	6.3	1	HI
23CXP4	6.3	1	HI
23CZP4	6.3	4	HI
23DP4	6.3	1	HI
23DBP4	6.3	1	LO
23FP4	6.3	1	HI
23GP4	6.3	1	HI
23HP4	6.3	1	HI
23JP4	6.3	3	LO
23KP4	6.3	1	HI
23MP4	6.3	1	HI

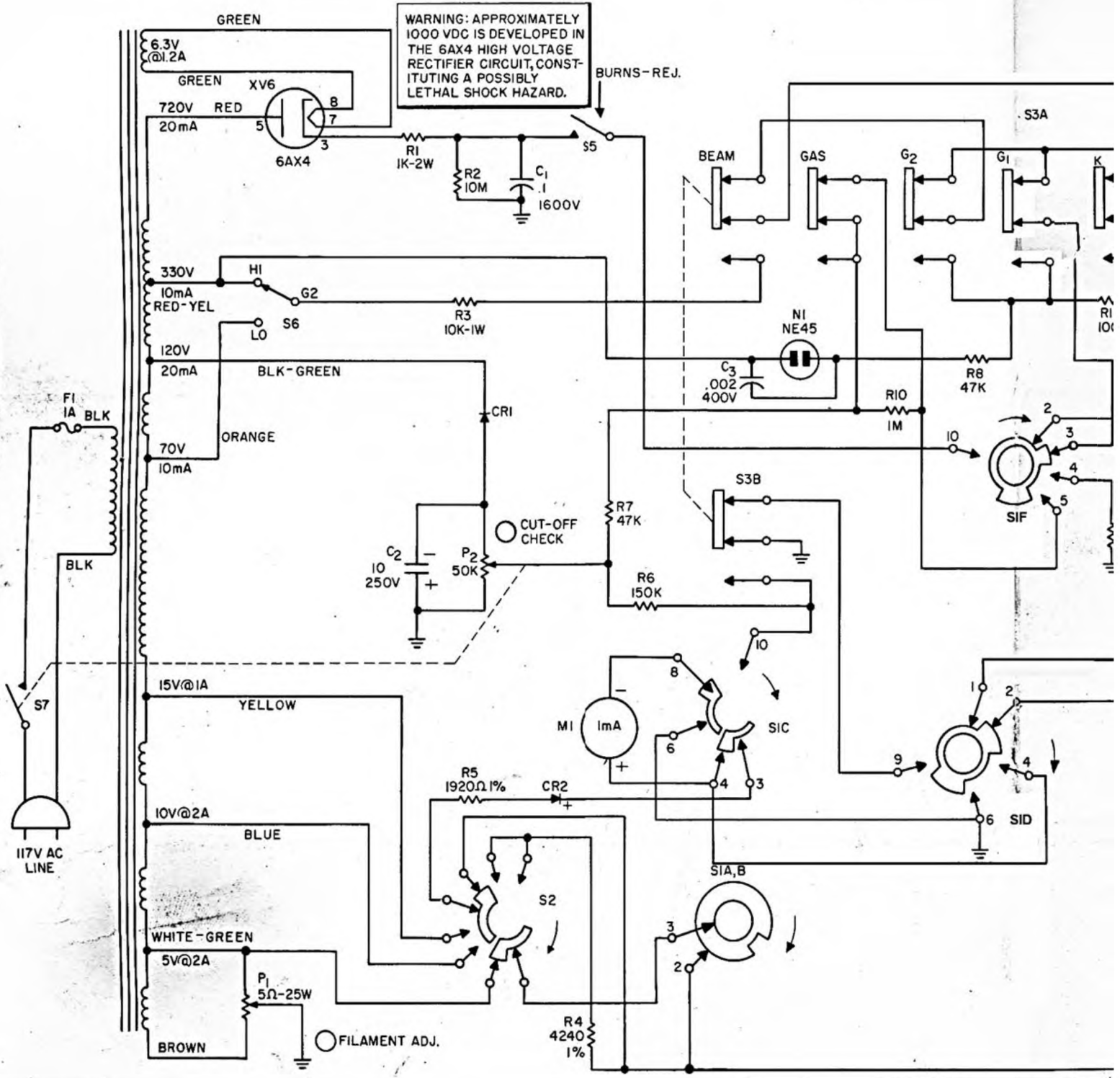
## COLOR TUBES

21AXP22 * 6.3	5	HI	21FBP22 ‡ 6.3	5	HI
21AXP22A* 6.3	5	HI	21FJP22 ‡ 6.3	5	HI
21CYP22 * 6.3	5	HI	21FKP22 ‡ 6.3	5	HI
21CYP22A* 6.3	5	HI			

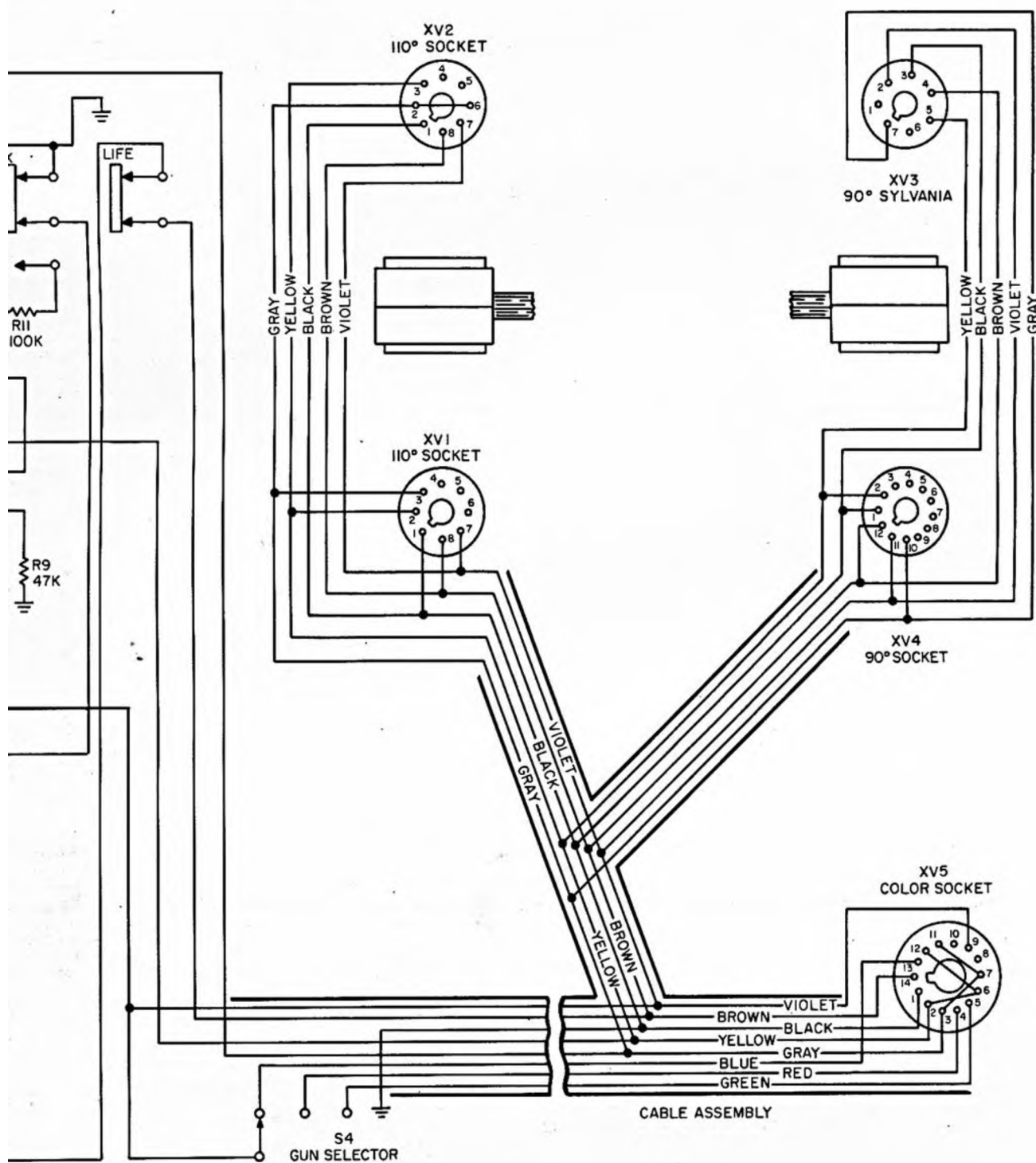
\*TUBE GOOD IF READS 45 OR MORE ON THE 0-150 SCALE

‡TUBE GOOD IF READS 30 OR MORE ON THE 0-150 SCALE

**SCHEMATIC DIAG**



POSITION	CONTACTS MADE			
	SIA,B-	SIC	SID	SIF
1. SHORT/OPEN	2-3	3-4 6-8	1-2	2-3
2. BEAM/LIFE	2-3	6-8	1-4-9	2-4
3. CUT-OFF/GAS	2-3	8-10	1-4-9	2-5
4. BURNS	—	—	1-6	2-10
5. REJUV.-WELDING	2-3	6-8	1-6	2-10



## NOTES

1. RESISTORS ARE IN OHMS UNLESS OTHERWISE SPECIFIED.
2. CAPACITORS ARE IN MICROFARADS.
3. ALL SWITCHES ARE SHOWN IN FURTHEST COUNTER-CLOCKWISE POSITION AS SEEN FROM SHAFT SIDE.



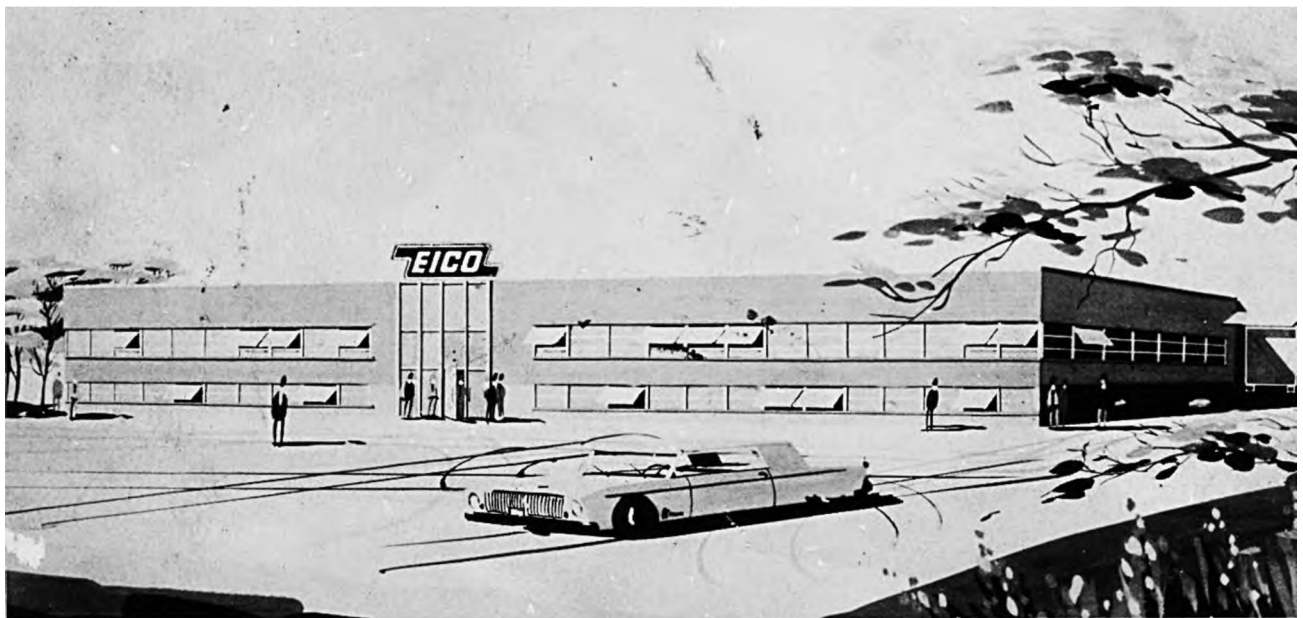
Since 1945, EICO has been recognized as a leader in the design and manufacture of electronic products in kit form. The wide range of equipment that EICO has made available covers nearly every phase of electronics—High Fidelity (Receivers, Amplifiers, Tuners and Speakers); tape recorders; test instruments, Citizen Band and Amateur Radio and Transistor Radios.

There is virtually no area of our every day life where EICO Products do not make a contribution. For there are more than 2,000,000 EICO Electronic Products in use in American homes, industry, military as well as in Federal, State and local Government. In the Nation's schools, EICO Test Instruments and training aids make it easier for students to learn about electricity and electronics.

Most recently, EICO has entered the digital and data processing component fields.

In 17 years growth of EICO is a matter of public record. Responsible for this growth is the company's strict adherence to its policies of top quality products at reasonable prices. The Company's recent move to a modern 110,000 square foot plant adjacent to the World's Fair site marks the beginning of another era in EICO product development and contribution to the Nation's economy.

**EICO's New 110,000 Square Foot Plant Adjacent to the World's Fair Site.**



Eico Electronic Instrument Co., Inc., 131-01 39th Avenue, Flushing, N. Y. 11352